ESTIMATED VALUE OF
BARGE FREIGHT RATES FOR
COMMODITIES SHIPPED ON
THE MISSOURI RIVER AND
IMPLIED FREIGHT SAVINGS

A Survey by the Food and Agricultural Policy Research Institute
At the University of Missouri—Columbia

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FAPRI
At the University of Missouri
Food and Agricultural Policy Research Institute

101 Park DeVille Drive, Suite E
Columbia, MO 65203
573-882-3576
www.fapri.missouri.edu
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The Food and Agricultural Policy Research Institute at the University of Missouri conducted a survey of 39 terminals and businesses along the Missouri River from Sioux City, Iowa to the mouth of the river at St Louis during the first quarter of 2004. The purpose of the survey was to ascertain the economic value of barge traffic—freight rates on the river relative to alternative transportation (train and truck). Terminals reflecting the greatest volume of business were specifically surveyed for shipment of products associated with grains and oilseeds, fertilizer, cement, asphalt, and sand and gravel. As a result, this survey should not be viewed as a complete set of business along the river; however, considerable effort was made to insure that all regions of the river were adequately represented.

Survey Questions and Method of Data Collection

The survey was conducted from the “terminal list” provided by the Corps of Engineers. This list includes terminals beginning at mile marker 27.8 and ends at marker 731.2 at Sioux City, Iowa. Considerable attention was paid to the businesses reflecting the greatest volume of traffic. Most of this information was gained by telephone interviews as these businesses were very helpful in identifying the most significant uses of barge transportation.

In each case, terminals were asked to provide the following information:
- Amount of barge traffic by commodity and tonnage for the average in a year when river traffic was viable.
- Amount of barge traffic shipped in 2003 by commodity and tonnage
- Differential freight rate for transportation delivered by either truck or train or both—specifically the additional cost by commodity per ton, for alternative shipments not delivered on the river in 2003.

Data reflect the survey results by category. In many cases these data have been cross-referenced and double checked as consolidations have occurred since the publication of the original “terminal list.” Also, back-up calls have been made to insure that collected data were correctly interpreted and appropriately categorized. Obviously, any mistakes or misinterpretation are solely the responsibility of the authors.

In all cases each of the terminal operations was extremely cooperative. Each individual terminal was carefully interviewed and tabulated with the specific agreement that data would be aggregated to the extent that no individual firm, business, or terminal could specifically be identified. We sincerely appreciate all the cooperation received and the very careful attention paid to the specific estimation of alternative transportation rates. In many cases specific
statements were collected regarding river traffic and reliability. Many of these comments are also contained in this report.

Aggregate Survey Results by Major Category

Table 1 reflects summary data aggregated across responding terminals and businesses along the river. In this survey, commercial traffic is considered to be all commodities reported as grain oilseeds, fertilizer, cement, and asphalt less sand and gravel. However, several sand and gravel companies were surveyed and their differential cost reflecting the shorter season and low flows is also reported for 2003. Commodities not included in the survey averaged about 150,000 tons over the 1998-2002 period. Metals, coke, and chemicals other than fertilizer make up the majority of the “other” category.

Table 1. Comparison of reported Corps of Engineers data relative to FAPRI Survey

<table>
<thead>
<tr>
<th></th>
<th>Corps of Engineers Estimates</th>
<th>FAPRI Survey*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains and Oilseeds</td>
<td>654,000</td>
<td>673,000</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>457,000</td>
<td>325,000</td>
</tr>
<tr>
<td>Asphalt</td>
<td>239,000</td>
<td>253,000</td>
</tr>
<tr>
<td>Cement</td>
<td>120,000</td>
<td>121,000</td>
</tr>
<tr>
<td>Sub-total Commercial</td>
<td>1,470,000</td>
<td>1,372,000</td>
</tr>
<tr>
<td>Sand and gravel</td>
<td>6,644,000</td>
<td>7,676,000</td>
</tr>
<tr>
<td>Sub-total</td>
<td>8,114,000</td>
<td>9,048,000</td>
</tr>
<tr>
<td>Other**</td>
<td>228,000</td>
<td>204,000</td>
</tr>
<tr>
<td>Total</td>
<td>8,342,000</td>
<td>9,252,000</td>
</tr>
</tbody>
</table>

*Based on a survey of 39 terminals along the Missouri River conducted between January and April 2004.
** Commodities not included in the FAPRI survey, such as coke, metals, and chemicals other than fertilizer.

Respondents reported that a total of 673,000 commercial tons were shipped in 2003, about 54 percent of the average tonnage reported by the Corps of Engineers for the period 1980-2002.

The estimated change in transportation cost per ton from the survey represents a weighted average to insure that specific operation size is taken into consideration. Fertilizer differential transportation cost is estimated to be the highest per ton at $13.16 followed by cement at $13.05, asphalt at $6.76, and grains and oilseeds at $4.85 or approximately 15 cents per bushel.
Extrapolation for Total River Value of Transportation

Table 2 is constructed to reflect estimated differential transportation savings associated with the ability to move the entire commercial average tonnage (1,236,200 tons as reported by the Corps of Engineers for the period 1998-2002) by barge—a river situation that is viable for barge transportation of commercial commodities. In this case, the industry is estimated to save $10,427,126 as this reflects the differential cost of shipping 1,236,200 tons via rail and truck.

Table 2. Cost savings associated with availability of river transportation based on 1998-2002 Corps of Engineers estimates of shipments and FAPRI survey estimates of cost savings per ton

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains and Oilseeds</td>
<td>527,400</td>
<td>$4.85</td>
<td>$2,557,890</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>326,400</td>
<td>$13.16</td>
<td>$4,295,424</td>
</tr>
<tr>
<td>Asphalt</td>
<td>225,200</td>
<td>$6.76</td>
<td>$1,522,352</td>
</tr>
<tr>
<td>Cement</td>
<td>157,200</td>
<td>$13.05</td>
<td>$2,051,460</td>
</tr>
<tr>
<td>Sub-total Commercial</td>
<td>1,236,200</td>
<td></td>
<td>$10,427,126</td>
</tr>
<tr>
<td>Sand &amp; Gravel</td>
<td>8,175,400</td>
<td>$0.35</td>
<td>$2,617,720</td>
</tr>
</tbody>
</table>

* Conducted between January and April 2004

These differential rates suggest that river availability is extremely important to the industry. Applying Corps of Engineers average data and FAPRI estimated saving per ton, the fertilizer industry is faced with the highest total estimated industry differential, $4,295,424. Grain and oilseeds are second at $2,557,890 followed by cement at $2,051,460 and asphalt at $1,522,352.

A lower limit estimate can be expected by applying the transportation differentials obtained from the survey as reported in Table 2. The main reason that this may reflect a lower limit estimate is that competition can be expected in the transportation industry. As reported in other studies (TVA) the train freight rates tend to become lower as the river is approached. If this is the case, then a no barge traffic situation could be expected to result in transportation differentials that are greater than reported in Table 2. These additional costs are not addressed in this study as the primary focus was on estimating an aggregate set of estimates of transportation cost in a low river year as a point of reference for the value of barge traffic.

Sand and gravel companies along the river were also included in the survey to ascertain whether alternative transportation was necessary during the 2003 low flow season. In all cases, these companies were able to continue barge movement, however at a higher differential cost reflecting a shorter season and low water flows. These costs were specifically associated with

- overtime work to make up for a shorter season,
- lighter loads requiring more loads, and
- higher maintenance and repair and replacement associated with damages sustained from low flows.
Additional cost experience by the companies moving 7,899,650 tons of sand and gravel was $0.35 per ton. If this expense is applied to the Corps’ average of 8,175,400 tons shipped between 1998 and 2002, this reflects an additional $2,617,720 for the industry. This may reflect savings relative to the low flow in 2003. However, it is difficult to extrapolate beyond 2003 conditions, especially for an entire season of low flows and tighter restrictions. Therefore, it is implicit that the estimate of $2,617,720 does reflect the value of a viable river for barge traffic relative to low flow conditions experienced in 2003. Although no estimates were given for a complete transition from use of the river, several operators indicated cost of transition substantially higher than $0.35 per ton.

Detailed Survey Results

Table 3 is constructed to show the number of barges used in a normal year, the actual number of barges used in 2003, their relative tonnages and other costs incurred in 2003 by commodity.

Table 3. Indicators of Costs Associated with 2003 Restrictions on Missouri River Transportation*

<table>
<thead>
<tr>
<th>Barges</th>
<th>Normal Year</th>
<th>2003 Actual</th>
<th>Difference</th>
<th>Tons Shipped</th>
<th>Normal Year</th>
<th>2003 Actual</th>
<th>Difference</th>
<th>Other Costs*** (Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>215</td>
<td>75</td>
<td>-140</td>
<td>322,500</td>
<td>112,500</td>
<td>-210,000</td>
<td>$0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertilizer</td>
<td>230</td>
<td>91</td>
<td>-139</td>
<td>276,000</td>
<td>109,200</td>
<td>-166,800</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>Asphalt</td>
<td>126</td>
<td>86</td>
<td>-40</td>
<td>346,500</td>
<td>236,500</td>
<td>-110,000</td>
<td>$589,600</td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>259</td>
<td>179</td>
<td>-80</td>
<td>310,800</td>
<td>214,800</td>
<td>-96,000</td>
<td>$35,000</td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td>830</td>
<td>431</td>
<td>-399</td>
<td>1,255,800</td>
<td>673,000</td>
<td>-582,800</td>
<td>$624,600</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>11,923</td>
<td>14,580</td>
<td>2,657</td>
<td>7,819,650</td>
<td>7,899,650</td>
<td>80,000</td>
<td>$451,600</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$1,076,200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Based on a survey of 39 terminals along the Missouri River conducted between January and April 2004.
** Low river levels meant that it took more barges to move a given amount of sand and gravel in 2003, at higher overall cost.

The survey data was aggregated into two major categories
- Commercial
- Sand and Gravel

This aggregation follows the Corps of Engineers methodology with the commercial sector including the shipments of grains and oilseeds, fertilizer, asphalt and cement. The survey respondents reported their commodity shipments in some combination of total tonnages, tonnages per barge or total barges. Within each commodity, there was a great deal of uniformity
in tonnages per barge number, but was not consistent. To minimize confusion, the research team made the following tonnage per barge numbers per commodity.

Grains and Oilseeds – 1,500 tons/barge  
Fertilizer – 1,200 tons/barge  
Asphalt – 2,750 tons/barge  
Cement – 1,200 tons/barge

Grains and Oilseeds - The survey data indicated that on an average year 322,500 tons of grains and oilseeds were shipped utilizing 215 barges. In 2003, 112,500 tons were shipped utilizing 75 barges. Using a cost factor of $4.85/ton for alternate shipping methods, the 210,000 tons not shipped on the Missouri River in 2003, cost the industry an additional $1,018,500.

Fertilizer - The survey data indicated that on an average year 276,000 tons of fertilizer were shipped utilizing 230 barges. In 2003, 109,200 tons were shipped utilizing 91 barges. Using a cost factor of $13.16/ton for alternate shipping methods, the 166,800 tons not shipped on the Missouri River in 2003, cost the industry an additional $2,194,620.

Asphalt – The survey data indicated that on an average year 346,500 tons of asphalt were shipped utilizing 126 barges. In 2003, 236,500 tons of asphalt were shipped utilizing 86 barges. Using a cost factor of $6.76/ton for alternate shipping methods, the 110,000 tons not shipped on the Missouri River in 2003, cost the industry an additional $743,600. The respondents also reported additional costs, such as additional maintenance and repair costs and the upgrading rail terminal facilities for an additional cost of $589,600 bringing the total cost to $1,333,200.

Cement – The survey data indicated that on an average year 310,800 tons of cement were shipped utilizing 259 barges. In 2003, 214,800 tons of cement was shipped utilizing 179 barges. Using a cost factor of $13.05/ton for alternate shipping methods, the 230,400 tons not shipped on the Missouri River in 2003, cost the industry an additional $2,228,400. The respondents also reported additional costs, such as additional maintenance and repair costs and the upgrading of facilities for an additional cost of $35,000 bringing the total cost to $2,263,400.

The Corps of Engineers methodology considers the Sand and Gravel industry to be primarily a river maintenance function. Although the dredged sand and gravel does have a significant economic value, this action is essential in keeping the navigation channel open. The survey respondents indicated an average of 11,923 barges totaling 7,819,650 tons of sand and gravel are dredged from the Missouri River. In 2003, the sand and gravel companies surveyed indicated that 14,580 barges for a total of 7,899650 tons of sand were dredged from the Missouri River. The respondents also reported $451,600 of additional costs attributable to the lower water levels in 2003. These costs included additional repair and maintenance on equipment, the redesign and construction costs involving equipment and facilities necessary for the transfer of the sand and gravel from the barges to the shore due lower water levels. Additional overtime pay was needed due to the increased number of barge trips with lower tonnages per barge.
Survey Comparisons with Corps of Engineers Reported Data

This data is presented in Tables 2 and 3. The 2003 FAPRI survey results are considerably lower than the Corps 5 year averages for grain and oilseed and fertilizer shipments.

The Corps’s asphalt shipments for the 5-year average are 225,200 tons. The FAPRI survey results for 2003 shipments of asphalt were found to be 236,500 tons. It is this commercial category that had very similar reported tonnages.

The Corps’s cement shipments for the 5-year average are 157,200 tons. The 2003 survey reported that cement shipments equaled 214,800 tons, substantially higher than the Corps 5-year average. Given these discrepancies, were concerned that some of the data had been double counted – the same shipments being handled and reported by two or more operators. A follow-up contact with barge and terminal operators was instituted to verify the accuracy of the survey results.

These differences certainly warrant more investigation. It is likely that grain and oilseed and fertilizer shipments are actually on the low side due to the extreme drought that has plagued the Missouri River Valley over the last two and a half years. Further, the estimates of average shipments may also reflect the expectation of persistence of this weather pattern, in the near future. Given this extended drought situation, it is very likely that these low-side estimates do reflect pessimism by terminal operators as they project average usage of the river.

A similar argument of expectations can be made for the high-side cement and asphalt estimates relative to the Corp’s average over the last five years. Given the stimulus from the low interest rates over the past two years, the construction industry has been in a growth cycle implying above average use of these products. Although on the high side, it is likely that growth expectations are build into the averages reported.

On the positive side, it is interesting to note that total commercial average tonnage is very close for the survey and the Corps – at 1,255,800 and 1,236,000 tons respectively.

Our initial responses, from the sand and gravel sector of river commerce was much lower than the Corps 5-year average. Upon revisiting our survey respondents, their comments and willingness to contact the contemporaries that had not made initial responses were instrumental in giving the survey a much more complete picture of this industry. This degree of cooperation is greatly appreciated by the FAPRI research staff. The Corps 5-year average was 7,479,200 tons as compared to the FAPRI survey total of 7,899,650 tons. Given the degree of cooperation and the knowledge base provided by the respondents, we feel that the FAPRI number accurately represents the sand and gravel industry in 2003. Extra efforts were made by this industry to keep the navigation channel open as long as possible in this very difficult low water year. This industry reported that an additional $2,232,500 was incurred in costs due directly to the low water conditions experienced in 2003.
Summary

Utilizing Corps of Engineers average data on river tonnage from 1998-2002 and the differential freight rates estimated from the FAPRI survey, an implied value of river transportation availability is approximately $10.4 million per year or approximately $8.43 per ton for commercial commodities shipped on the river.

It is difficult to place an equivalent value on the river for the sand and gravel industry. It is apparent that differentials will vary with river flow levels and months of restricted operation. As all companies attempt to sustain normal tonnage each year, it is apparent that shorter seasons and lower river flows will create variances around tonnage barged. As these differentials were not obtained in the survey it is implicit that the estimated shipping value of $2,617,720 relates specifically to conditions that defined the 2003 season. More severe restrictions and lower flows will result in higher numbers; however, it is not possible to generalize these differences from the survey.

As previously indicated, this is likely a low side value as the transportation industry is competitive and converting to truck and rail transport would be an added expense not addressed in this survey. Finally, it is likely that river traffic influences competitive freight rates as the river is approached. If this is the case, additional savings can be expected from the availability of the river. Also, these savings are not addressed in this report.
Summary of Survey Comments by Commodity

Grains
- When the river isn’t viable, rail is an alternative; however, we are finding available cars to be a constraint. Rail rate have gotten more expensive without the barge alternative.
- Would like to have the option but the river has become less viable, can’t always get good draft.
- A viable river gives more negotiation power on freight rates.
- Barge transportation has had excess capacity for many years. Like rail, the industry was retiring about three barges for each new one built. This reduced the excess and when the economy heated up and grain shipments jumped we saw freight levels higher than ever in the last five to seven years.

Fertilizer
- Imported fertilizer—added expense to off-load from barge to rail as rail terminals are on the east side of the Mississippi in New Orleans. Have to off-load in St Louis to barge which doubles handling cost as well as differential freight rates.
- All railroads are behind in orders. Anyone relying on standby car orders is last in the matrix. Simply put, increased demand for rail transportation and poor planning by carriers created the shortage we now experience.
- As the river is lowered the channel will narrow. Have spent money to increase efficiency with rail.

Cement
- Average shipments are most difficult to determine as the Missouri River has been a wild card to not only sourcing but the uncertainty for reliability of the river.
- There is large business to be had on the Missouri River. The key to our success is to be creative in achieving objectives.
- If river is not stabilized, cannot rely on barging will be forced to switch to trucking to meet customer needs. One barge hauls 1400 tons compared to a truck at 25 tons. This implies 56 trucks per barge costing a roundtrip distance of about 300 miles or 16,800 miles of highway travel. At 60 mph this implies 280 hours of highway driving per barge lost.

Sand and Gravel
- A low river means a shorter season. Worked overtime to make up the difference.
- More trips at a lighter load as draft was reduced from 8 feet to 6 feet.
- More maintenance required as barges are damaged in lower flow conditions.

Asphalt
- The financial impact is far greater if the river is non-navigable for six weeks in the summer, the height of the asphalt season.
- A Missouri River that is non-navigable year-round is the biggest financial impact to us, and the consequences can reach further out than just a freight difference.